CLAIMS

Claim 1

A method for producing a conductor board or print board having at least one ceramic layer (2) with at least one aperture (6) there through, at least two metal layers (3, 4), one on each side of said ceramic layer (2), and an electrical through contact (5, 5a, 5b) in said at least one aperture (6), said method comprising:

(a) applying one of each of said metal layers (3,4) on each side of said ceramic layer (2) by a direct copper bonding technique or by an active soldering technique, such that said metal layers (3,4) cover said aperture (6) on each side of said ceramic layer (2);

(b) permanently deforming one of said metal layers (3) into said aperture (6) by means of a stamp (7, 7a, 7b) while supporting the other of said metal layers (4) on a rest (10) such that a cone shaped segment (3′, 3a′, 3b′) is formed in said aperture; and

(c) connecting said segment (3', 3a', 3b') to said other of said metal layers (4) by electrical welding, with the stamp (7, 7a, 7b) and the rest (10) being used as welding electrodes, in order to form said electrical contact (5, 5a, 5b) and produce said conductor board.

Claim 2

Method of claim 1, wherein said one of said metal layers (3) is deformed by a cone-shaped end (11) of said stamp (7a) such, that the cone-shaped segment (3a') extends to the other metal layer (4), and wherein the tip of said cone-shaped segment (3a') is connected to the other metal layer (4) at by the welding process.

Claim 3

Method according to claim 1, further comprising: inserting a body (9) of electrically conductive material in the aperture (6), said body having a height (h) smaller than the thickness (d_c) of the layer (2) of the ceramic; and wherein said one of said metal layers (3) is deformed so that both of said metal layers (3,4) are in contact with the body (9) in the region of the aperture; said metal

layers (3,4) are electrically connected to the body (9); and said one of said metal layers (3) which is conical deformed is connected to the body (9) with its tip by electrical welding.

Claim 4

Method according to claim 1, wherein at least one of said metal layers (3) is deformed in the manner of a hollow rivet or sleeve in the region of the aperture (6).

Claim 5

Method according to claim 1, wherein deforming of the one of said metal layers (3) and/or the electrical connecting take place after conclusion of the direct copper bending or after the active soldering.

Claim 6

Method according to claim 1, wherein the electrical welding is effected during or immediately after the deformation of the one of said metal layer (3), with the tool (7, 7a, 7b) employed for deformation.

Claim 7

Method according to claim 1, wherein connecting is effected by heating in an N_2/O_2 atmosphere having an O_2 content of 5-800 ppm upon heating to a direct copper bonding temperature.

Claim 8

Method according to claim 1, wherein the connecting is effected using a solder.

Claim 9

Method according to claim 1, wherein the connecting is effected using a conductive paste.

Claim 10

Method according to claim 1, wherein said layer (2) has a thickness in the range between about 0.15 and 2 mm.

Claim 11

Method of claim 1, wherein the direct copper bonding technique is performed at a processing temperature of about 1065°C to 1083°C.

Claim 12

Method of claim 1, wherein the active soldering technique is performed at a processing temperature of about 800°C to 1000°C.

Claim 13

A method of claim 1, wherein said metal layers are copper foils of a thickness of about 0.2 to 1 times the thickness of the ceramic layer (2), and said aperture (6) has a diameter of about 0.9 to 10 times of the thickness of the layer (2).

Claim 14

A method for producing a conductor board comprising:

(a) inserting a body (9) of electrically conductive material into an aperture (6) of a dielectric layer (2), said body (9) having a height (h) smaller than the thickness (d_c) of layer (2);

(b) applying one of each of two metallization (3,4) on two mutually opposed faces of said dielectric layer (2) by a direct copper bonding technique or an active soldering technique such that said aperture (6) is covered by said metalizations (3,4);

(c) deforming at least one of said metalizations (3,4) so that both of said metalizations (3,4) contact body (9);

(d) electrically connecting said body (9) to both said metalizations (3,4).

Claim 15

Method according to claim 14, wherein only one of the two metalizations (3,4) is deformed.

Claim 16

Method according to claim 15, wherein the body (9) satisfies the following conditions:

$$h \leq d_c \, [(1 + (\alpha_1 - \alpha_2) \, \Delta T] + K.$$

wherein

d_c is the thickness of the layer (2)

α_1 is the coefficient of thermal expansion of the material of the layer (2);

α_2 is the coefficient of thermal expansion of the material of the inserted body (9);

ΔT is the temperature difference between the maximum process temperature used in electrically connecting and room temperature;

K is a correction factor.

Claim 17

Method according to claim 16 wherein direct copper bonding is employed to apply metallization (3,4) to layer (2) and the correction factor K is equal to double the thickness of layer of the fusion zone occurring in the direct copper bonding.

Claim 18.

Method according to claim 17, wherein the correction factor K has a value of from 5 to 50 microns.

Claim 19

A conductor board comprising:

at least one layer (2) of ceramic areally provided on two mutual opposed faces with at least one metalization (3,4) each and having at least one through contacting (5) in the region of an aperture (6), metal foils forming said metalization being applied to said faces by means of direct copper bonding technique or by active soldering, said foils cover the at least one aperture (6), the metalizations being electrical connected to each other through the aperture (6), wherein only one of the metalizations (3,4) is permanently deformed so as to form an conical section (3') acting as a through contacting (5, 5a, 5b) in the region of the aperture (6) and extending into the aperture (6), and a tip of said section (3') is electrically connected to the other metalization (4) in the region of the aperture (6) by electrical welding.

Claim 20

Conductor board according to claim 19, wherein a body (9) of electrically conductive material is inserted into aperture (6), said body (9) having height (h) which is smaller than the thickness (d_c) of the layer (2), and at least one metalization (3) is so deformed that both metalizations (3,4) lie in contact with the body (9) in the region of the aperture (6), and in that the metalizations (3,4) are electrically connected to the body (9).

Claim 21

Conductor board according to claim 20, wherein the body (9) satisfies the following conditions:

$$h \leq d_c\ [(1 + (\alpha_1 - \alpha_2)\ \Delta T] + K.$$

wherein

d_c is the thickness of the layer (2);

α_1 is the coefficient of thermal expansion of the material of the layer (2);

α_2 is the coefficient of thermal expansion of the material of the inserted body (9);

ΔT is the temperature difference between the maximum process temperature used in electrically connecting and room temperature;

K is a correction factor.

Claim 22

Conductor board according to claim 21, wherein direct copper bonding is employed to apply metalizations (3,4) to layer (2), and the correction factor K is equal to double the thickness of layer of the fusion zone occurring in the direct copper bonding.

Claim 23

Conductor board according to claim 21, wherein the correction factor K has a value of from 5 to 50 microns.

Claim 24

Conductor board according to claim 19, wherein one metalization (3) is so deformed in the region of the aperture (6) that it extends up to the other metalization (4).

Claim 25

Conductor board according to claim 19, wherein the deformation of the one metalization (3) is effected with a stamp (7, 7a, 7b).

Claim 26

Conductor board according to claim 19, wherein at least one metalization (3) is deformed in the manner of a hollow rivet or sleeve in the region of the aperture (6).

Claim 27

Conductor board according to claim 19, wherein at least one metalization (3) is deformed in the manner of a dish in the region of the aperture (6).

Claim 28

Conductor board according to claim 19, wherein the electrical connecting is effected by electric, ultrasonic and/or laser welding.

Claim 29

Conductor board according to claim 19, wherein the electrical connecting is effected with the aid of a direct bonding process or an active soldering process.

Claim 30

Conductor board according to claim 19, wherein the electrical connecting is effected using a solder.

Claim 31

Connector board according to claim 19, wherein the electrical connecting is effected using a conductive paste.

Claim 32

Conductor board according to claim 19, wherein the layer (2) has a thickness in the range between about 0.15 and 2 mm.

Claim 33

Conductor board according to claim 19, wherein the metalizations (3,4) are metal foils having a thickness d_{cu} equivalent to about 0.2 to 1.0 times the thickness of the layer (2).

Claim 34

Conductor board according to claim 19, wherein the aperture (6) for the at least one through contacting (5, 5a, 5b, 5c) has a diameter of about 0.9 to 10 times the thickness (d_c) of the layer (2).

Claim 35

Conductor board comprising:

at least one layer (2) of a ceramic areally provided on two mutual opposed faces with at least one metalization (3,4) each, and having at least one through contacting in the region of an aperture (6), said metalization being formed by metal foils which cover the at least one aperture (6), a body (9) of electrically conductive material being inserted in the aperture (6) and electrically connected to the metalization (3,4), wherein the height (h) of the metal body (9) is smaller than the thickness (d_c) of the layer (2) of ceramic, and are at least one metalization (3) is conical deformed so that both metalizations (3,4) are in contact with the body (9) in the region of the aperture (6), with the conical deformed metalization (3) having a tip which is connected to the body (9) by electrical welding.

Claim 36

Conductor board according to claim 35 wherein only one of the two metalizations (3,4) is deformed.